

WE CLAIM

1. An audio circuit comprising a sound source having an output for producing an audio signal, a primary connector, and a connector header, said primary connector being electrically coupled to said sound source output to receive the audio signal, said connector header comprising:
 - a first contact electrically coupled to the sound source output,
 - a second contact electrically coupled to said primary connector, and
 - a ground contact that is electrically coupled to a ground;
 each one of said header first contact and said second contact being ungrounded; said audio circuit optionally including a secondary connector circuit comprising:
 - a secondary connector first contact electrically coupled to said header first contact,
 - a normally-open secondary connector second contact electrically coupled to said header second contact, and
 - a normally-open switch electrically coupled to said header ground contact; said switch being operable to electrically couple said header second contact to said header ground contact to short said primary connector to said ground while said switch is in its closed position;
 said audio circuit being operable in each one of a first configuration that does not include said secondary circuit and a second configuration that includes said secondary circuit.
2. The audio circuit of claim 1 further comprising a main output contact disposed on the printed circuit board and being electrically coupled to said sound source output to receive the audio signal, the primary connector including a switch capable of muting the audio signal to the main output contact.
3. The audio circuit of claim 1 wherein said header includes
 - a fourth contact electrically coupled to a right channel signal of the sound source output, and
 - a third contact electrically coupled to a right contact of said primary connector, said header first contact being electrically coupled to a left channel signal of the sound

Sub
A1

004790-12546560

source output, said second contact being electrically coupled to a left contact of said primary connector; said secondary circuit including an other switch coupled to said header ground contact; said other switch being operable to electrically couple said header third contact to said header ground contact to short said right contact of said primary connector to said ground while said switch is in its closed position.

4. The audio circuit of claim 3 wherein said header first contact, said header second contact, said left channel signal of said sound source output, and said left contact of said primary connector form a left audio channel; and said header fourth contact, said header third contact, said right channel signal of the sound source output, and said right contact of said primary connector form a right audio channel.

5. The audio circuit of claim 1 wherein each one of said sound source output, said primary connector, and said connector header are mechanically affixed to a printed circuit board and the optional secondary connector is spaced apart from the printed circuit board, said secondary connector being connected to said header by a wiring harness.

6. The audio circuit of claim 5 wherein said primary connector is a local connector and said secondary connector is a remote connector.

7. The audio circuit of claim 6 wherein said primary connector is a rear headphone connector and said secondary connector is a front headphone connector.

8. The audio circuit of claim 2 wherein each one of said sound source output, said primary connector, and said main output contact being electrically coupled together in series such that said main audio contact receives the audio signal from the audio circuit through said primary connector.

9. The audio circuit of claim 1 further comprising a first op-amp, a first resistor, and a second resistor, said first op-amp electrically coupled to said sound source output, said first op-amp and said first resistor being electrically coupled between said sound source

00490-1254550

21

output and said header first contact, said second resistor being electrically coupled between said first op-amp and said primary connector.

10. The audio circuit of claim 9 wherein said first op-amp, said first resistor, and said header first contact are electrically coupled together in series, said second resistor is electrically coupled between an output of said op-amp and said header second connector, and said second resistor is electrically coupled between the output of said op-amp and said primary connector such that said header second contact and said primary connector are electrically coupled together in parallel relative to said second resistor.

11. The audio circuit of claim 4 further comprising a first op-amp, a second op-amp, a first resistor, a second resistor, a third resistor, and a fourth resistor; said first op-amp, said first resistor, and said header first contact being electrically coupled together in series, said second resistor being electrically coupled between an output of said first op-amp and said header second contact, and said second resistor being electrically coupled between the output of said first op-amp and said left contact of said primary connector such that said header second contact and said primary connector are electrically coupled together in parallel relative to said second resistor, said second op-amp; said second op-amp, said third resistor, and said header third contact being electrically coupled together in series, said fourth resistor being electrically coupled between an output of said second op-amp and said header fourth contact, and said fourth resistor being electrically coupled between the output of said second op-amp and said right contact of said primary connector such that said header fourth contact and said right contact of said primary connector are electrically coupled together in parallel relative to said fourth resistor.

12. The audio circuit of claim 1 further comprising a first op-amp, a second op-amp, a first resistor, and a second resistor, each one of said first op-amp and second op-amp electrically coupled to said sound source output in parallel, said first op-amp and said first resistor being electrically coupled between said sound source output and said header first contact, said second resistor being electrically coupled between said second op-amp and each of said header second contact and said primary connector such that said header

second contact and said primary connector are coupled in parallel relative to said second connector.

13. The audio circuit of claim 12 further comprising a third op-amp, a fourth op-amp, a third resistor, and a fourth resistor; each one of said third op-amp and said fourth op-amp being electrically coupled to a right channel signal of said audio circuit in parallel, said third op-amp, said third resistor, and said header third contact being electrically coupled together in series, said fourth resistor being electrically coupled between an output of said fourth op-amp and said header fourth contact, and said fourth resistor being electrically coupled between the output of said fourth op-amp and said right contact of said primary connector such that said header fourth contact and said right contact of said primary connector are electrically coupled together in parallel relative to said fourth resistor;

whereby said first op-amp and said first resistor are electrically coupled between a left channel signal of said sound source output and said header first contact, and said second resistor is electrically coupled between said second op-amp and each of said header second contact and a left contact of said primary connector such that said header second contact and said left contact of said primary connector are coupled in parallel relative to said second connector.

14. The audio circuit of claim 12 further comprising a main output contact disposed on the printed circuit board and being electrically coupled to said sound source output to receive the audio signal, the primary connector including a switch capable of muting the audio signal to the main output contact.

15. An audio circuit including a sound source for producing an audio signal output, said audio circuit comprising:

a connector header comprising:

a first contact electrically coupled to the audio signal output,
a second contact electrically coupled to a control voltage,
a ground contact that is electrically coupled to a ground, each one of said header first contact said second contact being ungrounded;

09594524-061400

a primary connector being electrically coupled to said audio signal output in parallel with said connector header first contact to receive the audio signal, a normally closed first primary switch being electrically coupled between said audio signal output and said primary connector, and being electrically coupled to the control voltage for operation thereby to switch the audio signal to the primary connector;

said audio circuit optionally including a secondary connector circuit comprising:

a secondary connector first contact electrically coupled to said header first contact, a normally-open secondary connector second contact electrically coupled to said header second contact, and a secondary switch electrically coupled to said header ground contact; said secondary switch being operable to electrically couple said header second contact to said header ground contact to short the control voltage to said ground while said secondary switch is in its closed position, thereby muting the audio signal at the primary connector;

said audio circuit being operable in each one of a first configuration that does not include said secondary circuit and a second configuration that includes said secondary circuit.

16. The audio circuit of claim 15 further comprising a main output contact disposed on the printed circuit board and being electrically coupled to said audio signal output to receive the audio signal, whereby the audio signal is muted at the main output contact in response to said muting of the audio at said primary connector.

17. The audio circuit of claim 15 further comprising a normally closed second primary switch being electrically coupled between a right channel signal of said audio signal output and a right contact of said primary connector, and said header further includes a third contact electrically coupled to the right channel signal of the audio signal output, said second primary switch being electrically coupled to the control voltage for operation thereby to provide the audio signal to the primary connector.

18. The audio circuit of claim 15 further comprising a first op-amp, a second op-amp, a

09594524.061400

A

first resistor, and a second resistor; each one of said first op-amp and said second op-amp being electrically coupled to the audio signal output in parallel; said first op-amp, said first resistor and said header first contact being electrically coupled together in series, said first primary switch, said second op-amp, said second resistor, and a first contact of said primary connector being electrically coupled together in series; said first primary switch being operable to switch the audio signal on or off at a left contact of said primary connector.

19. The audio circuit of claim 18 further comprising third op-amp, a fourth op-amp, and a second primary switch, and said connector header includes a third contact; each one of said third op-amp and said fourth op-amp being electrically coupled to a right channel signal of the audio signal output in parallel; said third op-amp, said third resistor and said header third contact being electrically coupled together in series, said second primary switch, said second op-amp, said second resistor, and a second contact of said primary connector being electrically coupled together in series; said second primary switch being operable to switch the audio signal on or off at a right contact of said primary connector.

20. A dual-configuration audio system for processing an audio signal, said audio system being operable in each one of a first configuration and a second configuration, wherein:

said first configuration comprises:

- 20 a printed circuit board having a sound source mounted thereon, said sound source providing the audio signal;
- a connector header having plural contacts therein and coupled to the printed circuit board and being in electrical communication with the sound source such that the audio signal is coupled to said header, and
- 25 an auto-muting primary connector including a primary socket coupled to the printed circuit board for removably receiving a primary plug, said primary connector receiving the audio signal; and

said second configuration comprises said printed circuit board, said header, and said primary connector, and further comprises:

00490" 4254560

A

a secondary connector including a secondary socket being spaced apart from said printed circuit board for removably receiving a secondary plug, and a wiring harness having a wiring harness plug that is insertable into said header, said wiring harness electrically coupling said secondary connector to said header such that the secondary connector receives the audio signal.

5

21. The dual-configuration audio system of claim 20 wherein the audio signal is muted at the primary connector in response to insertion of the secondary plug into the secondary connector in the second configuration.

22. The dual-configuration audio system of claim 21 wherein the primary connector is shorted to a ground in response to insertion of the secondary plug into the secondary connector, thereby muting the audio signal at the primary connector.

23. The dual-configuration audio system of claim 20 further comprising a main output contact in electrical communication with the sound source and coupled to the printed circuit board, said main output contact receiving the audio signal, the audio signal being muted at the main output contact in response to insertion of the primary plug into the primary connector in said first configuration.

24. The dual-configuration audio system of claim 23 wherein the audio signal is muted at the main output contact in response to insertion of the secondary headphone plug into the secondary connector in the second configuration.

25. The dual-configuration audio system of claim 24 wherein the main output contact is shorted to a ground in response to insertion of the secondary plug into the secondary connector, thereby muting the audio signal at the main output contact and the primary connector.

26. The dual-configuration audio system of claim 20 wherein said header includes a non-conductive body and said plural pins that are disposed at least partially within said

09594524.061400

P

header body.

27. The dual-configuration audio system of claim 26 wherein said plural pins include an audio signal pin electrically coupled to the sound source for receiving the audio signal, a ground pin electrically coupled to a ground, a primary connector pin electrically coupled to said primary connector; each one of said audio signal pin, said ground pin, and said primary connector pin in said secondary configuration being coupled via said wiring harness to said secondary connector in a mutually open configuration, said secondary connector including a shunt disposed therein.

28. The dual-configuration audio system of claim 27 wherein said shunt electrically couples said primary contact pin to said ground pin in response to insertion of the secondary plug into said secondary connector, thereby muting the audio signal at the primary connector.

29. The dual-configuration audio system of claim 28 further comprising a main output contact electrically coupled to the sound source for receiving the audio signal through said primary connector, said primary connector including an auto-muting switch that interrupts the audio signal in response to insertion of the primary plug into said primary connector.

30. The dual-configuration audio system of claim 29 wherein insertion of the secondary plug into said secondary connector shorts each one of said main output contact and said primary connector to ground.

31. The dual-configuration audio system of claim 29 wherein the main output contact is a loudspeaker contact.

32. The dual-configuration audio system of claim 26 wherein said plural pins include a left audio signal pin electrically coupled to the sound source for receiving a left channel signal of the audio signal, a right audio signal pin electrically coupled to the sound source for receiving a right channel signal of the audio signal, a ground pin electrically coupled to

004454-0204-0000

21

a ground, a left primary connector pin electrically coupled to a left contact of said primary connector, a right primary connector pin electrically coupled to a right contact of said primary connector; each one of said left audio signal pin, said right audio signal pin, said left primary connector pin, said right primary connector pin, and said ground pin coupled to said primary connector in a mutually open circuit; each one of said audio signal pin, said ground pin, and said primary connector pin in said secondary configuration being coupled via said wiring harness to said secondary connector, said secondary connector including a left shunt and a right shunt disposed therein, said left shunt electrically coupling said left primary connector pin to said ground pin in response to insertion of the secondary plug into said secondary connector, said right shunt electrically coupling said right primary connector pin to said ground pin in response to insertion of the secondary plug into said secondary connector.

33. The dual-configuration audio system of claim 32 further comprising a left main output contact and a right main audio contact, said left main output receiving a left channel signal of the audio signal through a left contact of said primary connector, said right main output receiving a right channel signal of the audio signal through a right contact of said primary connector, said primary connector including an auto-muting switch that interrupts the audio signal to each one of said left main audio contact and said right main audio contact in response to insertion of the primary plug into said primary connector, each one of said left main audio contact, said right main audio contact, said primary connector left contact, and said primary connector right contact being shorted to the ground in response to insertion of the secondary plug into said secondary connector.

34. The dual-configuration audio system of claim 20 wherein the sound source includes a coder/decoder processor that converts a digital input to an analog output to produce said audio signal.

35. The dual-configuration audio system of claim 20 wherein the primary connector is a local connector and said secondary connector is a remote connector, and said secondary plug is a secondary headphone plug.

00490"42546560

36. The dual-configuration audio system of claim 35 wherein the primary connector is a primary headphone jack, said primary plug is a primary headphone plug, said secondary connector is a secondary headphone jack, and said secondary plug is a secondary headphone plug.

37. The dual-configuration audio system of claim 20 wherein the sound source is a codec.

38. The dual-configuration audio system of claim 34 wherein said primary headphone jack is accessible from a rear of a computer and said secondary headphone jack is accessible from a front of the computer.

39. The dual-configuration audio system of claim 20 further comprising a first op-amp, a second op-amp, a first resistor, and a second resistor, each one of said first op-amp and second op-amp electrically coupled to said sound source, said first op-amp and said first resistor being electrically coupled between said sound source and a header first contact, said second resistor being electrically coupled between said second op-amp and each of a header second contact and said primary connector such that said header second contact and said primary connector are coupled in parallel relative to said second connector.

40. A dual-configuration audio system comprising:

a printed circuit board having a sound source mounted thereon, said sound source providing an audio signal,

a connector header comprising:

a first contact pin electrically coupled to said sound source,

a second contact pin electrically coupled to a control voltage source,

a ground contact pin that is electrically coupled to a ground, each one of

said header first contact pin said second contact being ungrounded;

a primary connector being electrically coupled to said sound source in parallel with said connector header first contact pin to receive the audio signal,

a normally open first primary switch being electrically coupled between said sound source and said primary connector, and being electrically coupled to the control voltage source for operation thereby to switch the audio signal to the primary connector;

5 said audio system optionally including a secondary connector comprising:

a secondary connector first contact electrically coupled to said header first contact, a normally-open secondary connector contact electrically coupled to said header second contact, and

a secondary switch electrically coupled to said header ground contact pin; said secondary switch being operable to electrically couple said header second contact to said header ground contact to short the control voltage to said ground, thereby opening said switch to mute the audio signal at the primary connector;

said audio system being operable in each one of a first configuration that does not include

15 said secondary connector and a second configuration that includes said secondary connector.

41. The dual-configuration audio system of claim 40 further comprising a main output contact disposed on the printed circuit board and being electrically coupled to said sound source output to receive the audio signal, whereby the audio signal is muted at the main output contact in response to said muting of the audio at said primary connector.

42. The audio circuit of claim 40 further comprising a normally closed second primary switch being electrically coupled between a right channel signal of said audio signal output and a right contact of said primary connector, and said header further includes a third contact electrically coupled to the right channel signal of the sound source output, said second primary switch being electrically coupled to the control voltage for operation thereby to provide the audio signal to the primary connector.

43. The audio circuit of claim 40 further comprising a first op-amp, a second op-amp, a first resistor, and a second resistor; each one of said first op-amp and said second op-amp

00490"42546560

P1

being electrically coupled to the sound source output in parallel; said first op-amp, said first resistor and said header first contact being electrically coupled together in series, said first primary switch, said second op-amp, said second resistor, and a first contact of said primary connector being electrically coupled together in series; said first primary switch
5 being operable to switch the audio signal on or off at a left contact of said primary connector.

44. The audio circuit of claim 43 further comprising third op-amp, a fourth op-amp, and a second primary switch, and said connector header includes a third contact; each one of said third op-amp and said fourth op-amp being electrically coupled to a right channel
10 signal of the audio signal output in parallel; said third op-amp, said third resistor and said header third contact being electrically coupled together in series, said second primary switch, said second op-amp, said second resistor, and a second contact of said primary connector being electrically coupled together in series; said second primary switch being operable to switch the audio signal on or off at a right contact of said primary connector.

45. An audio circuit comprising an audio signal device, a primary connector, and a switchless connector header, each one of the audio signal device, the primary connector, and the connector header being disposed on a printed circuit board, said audio circuit optionally including a secondary connector circuit comprising a secondary connector and a normally open secondary connector switch, said switch operating in response to insertion
15 of a secondary plug into said secondary connector to mute or turn off said primary connector; said audio circuit being operable in each one of a first configuration that does not include said secondary circuit and a second configuration that includes said secondary circuit.

46. The audio circuit of claim 45 wherein the audio signal device is an audio input
25 device for receiving an audio signal, said primary connector being electrically coupled to audio input device, said connector header comprising:

- a first contact electrically coupled to an input of said audio signal device,
- a second contact electrically coupled to a signal voltage, and

004904254660

21

a third contact electrically coupled to the primary connector;
 said secondary connector switch disposed between the secondary connector and a ground,
 said secondary connector being electrically coupled between a ground and said third
 contact, said switch closing to short said primary connector to ground via said third contact
 5 in response to insertion of a secondary plug into said secondary connector, thereby turning
 off said primary connector.

47. The audio circuit of claim 45 wherein the audio signal device is an audio input
 device for receiving an audio signal, said primary connector being electrically coupled to
 audio input device, said connector header comprising:

- 10 a first contact electrically coupled to an input of said audio signal device,
 a second contact electrically coupled to a signal voltage, and
 a third contact electrically coupled to a control portion of a normally open primary
 switch primary connector, the switch being electrically coupled between the
 primary connector and a ground;
 15 said secondary connector switch being disposed between the secondary connector and a
 ground, said secondary connector being electrically coupled between a control voltage and
 said third contact, said secondary connector switch closing to couple the control voltage to
 the control portion of the primary switch via said third contact in response to insertion of a
 secondary plug into said secondary connector, thereby closing the primary switch to turn
 20 off said primary connector.

48. The audio circuit of claim 47 wherein the control portion of the switch is a gate of
 an FET.

49. The audio circuit of claim 45 wherein the audio circuit is an audio input device for
 receiving an audio signal, said primary connector being electrically coupled to audio input
 25 device, said connector header comprising:
 a first pair of contacts electrically coupled to a primary pair of channels of the
 audio input device and coupled to opposing sides of said primary
 connector;

004130-1254550

P.

a second pair of contacts electrically coupled to a secondary pair of channels of the audio input device

said secondary connector switch being a pair of secondary connector switches disposed between the secondary connector and the first pair of header contacts, each one of the secondary connector switches having a contact that is coupled to a ground and another contact that is coupled to one of the first pair of header contacts, said secondary connector being electrically coupled to the audio input device via said second pair of contacts, the pair of secondary connector switches closing to electrically couple each side of the primary connector to ground via the first pair of header contacts to short said primary connector to ground in response to insertion of a secondary plug into said secondary connector, thereby turning off said primary connector.

50. The audio circuit of claim 45 wherein the audio circuit is an audio input device for receiving an audio signal, said primary connector being electrically coupled to a pair of primary channels of the audio input device, said connector header comprising:

15 a first contact electrically coupled to control portions of a pair of normally open primary switches that are electrically coupled between the primary connector and a ground;

a pair of second contacts electrically coupled to a secondary pair of channels of the audio input device

20 the secondary connector switch having a contact that is coupled to a control voltage and another contact that is coupled to the first header contacts, said secondary connector being electrically coupled to the audio input device via the pair of second contacts, the secondary connector switch closing to electrically couple the control voltage to the control portion of the primary switches via the first contact in response to insertion of a secondary plug into said secondary connector, thereby closing the primary switch to turn off said primary connector.

51. The audio circuit of claim 50 wherein the primary switches are FETs and the control portion of each switch is a gate of the FET.

09594524.061400

52. A method of optionally coupling a secondary connector to a sound source that is operable for processing an audio signal either without the secondary connector or with the secondary connector coupled thereto, said method comprising the steps of:

providing a sound source for producing an audio signal, a connector header, and a primary
5 connector, the header having three electrically spaced-apart contacts disposed therein, a first one of the three header contacts receiving the audio signal, a second one of the three header contacts electrically coupled to the primary connector, a third one of the three header contacts electrically coupled to a ground; and
optionally coupling a secondary connector to said sound source via the header such that a
10 switch in the secondary connector shorts the third header contact to the second header contact to mute the audio signal at the primary connector, the first header contact providing the audio signal to the secondary header.

53. A method of optionally coupling a secondary connector to a sound source that is operable for processing an audio signal either without the secondary connector or with the
15 secondary connector coupled thereto, said method comprising the steps of:

providing a sound source for producing an audio signal, the sound card including a connector header, a normally open first primary switch, and a primary connector; the header having three electrically spaced-apart contacts disposed therein, a first one of the three header contacts receiving the audio signal, a second one of the
20 three header contacts electrically coupled to the first primary switch and to a control voltage, a third one of the three header contacts electrically coupled to a ground; and

optionally coupling a secondary connector to said sound source via the header such that a switch in the secondary connector shorts the third header contact to the second
25 header contact such that the control voltage is coupled to the ground, thereby opening the first primary switch to mute the audio signal at the primary connector, the first header contact providing the audio signal to the secondary header.

004790-42546560

A